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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/091,262	03/05/2002	Steven L. Stewart	USA/01/012	6437

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EXAMINER	
CHANG, VICTOR S	
ART UNIT	**PAPER NUMBER**
1771	

DATE MAILED: 01/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/091,262	STEWART ET AL.	
	Examiner	Art Unit	
	Victor S Chang	1771	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-164* is/are pending in the application.

4a) Of the above claim(s) *39-61 and 71-164* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-38 and 62-70* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *3/5/02* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2 IDS* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I, claims 1-70 in response filed 7/8/2003 is acknowledged. The traversal is on the ground(s) that "each of the Group I, II and III include the surface mount electronic device and the thermoplastic adhesive. This is not found persuasive because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper. Regarding to Applicants' election of Species A, claims 23-38, in response filed 9/22/2003, because Applicants did not distinctly and specifically point out the supposed errors in the restriction requirement, the Species election has been treated as an election without traverse (MPEP § 818.03(a). As such, the Examiner notes that claims 1-38 and 62-70 are now elected, and claims 39-61 and 71-164 are withdrawn.

The requirement is still deemed proper and is therefore made FINAL.

Claim Objections

2. Claims 2 and 7 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. It is noted that in claim 2, the recitation "adhesive is applied as a solid or semisolid to an adhesive

surface on said bottom surface" is inherently encompassed the recitation in claim 1, lines 2-3, " a solid or semi-solid thermoplastic adhesive adhered to a portion of a said bottom surface". Similarly, claim 7 appears fail to further limit the subject matter of a previous claim, since the only available surface on the connecting substrate is also the bottom surface, as self-evident in its dependent claims 8-9.

3. Claims 5, 6, 29-31, 33-34 and 36 are objected to because of the following informalities: Since multiple species are recited in each claim, the Examiner suggests that Markush format is more appropriate for these claims.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-38 and 62-70 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, lines 2-3, the phrase "solid or semi-solid" is vague and indefinite, because it is unclear as to the scope of the phrase. Do they mean the physical state of the material, or the structure of the material as "solid" (e.g., versus "porous")? For the purpose of this Office action, it is presumed to be the physical state of the material. Clarification is requested.

In claim 3, line 2, the term "is" appears redefining the electronic device as a BGA only, which appears to be inconsistent with the limitations of claims 1 and 2.

Clarification is requested. For the purpose of this office Action, it is presumed as "comprises".

In claim 14, last line, the term "through" is vague and indefinite. It is unclear what is the scope of "through". For the purpose of this Office Action, it is presumed as meaning "via". Clarification is requested.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-13, 16-19 and 62-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schrock et al. (US 6541872).

Schrock's invention is directed to a method of attaching a semiconductor die to an organic substrate. The die package comprises a die secured to a printed circuit board (PCB) with an adhesive tape (Abstract). Schrock teaches that the primary purpose of the semiconductor package is to provide a lead system for electrically and mechanically connecting the circuits on the die to a supporting structure such as a printed circuit board (column 1, lines 16-18). The adhesive tape has an adhesive such as pressure sensitive adhesives, thermoplastic adhesives, thermoset adhesives or the like (column 3, lines 50-52). The adhesive tape may be a single adhesive layer or a multi-layer film. In one embodiment, the adhesive tape comprises a first adhesive layer

adjacent to the organic support structure, a second adhesive layer adjacent to the semiconductor die (column 3, lines 62-67). In one embodiment, the interconnecting feature of the die package is a BGA (column 4, line 9), and Schrock teaches that "flip chip bonding" is a known art that BGA package (columns 1-2, bridging paragraph). In Fig. 6, Schrock shows a memory component in a BGA package.

For claims 1-5 and 7, although Schrock's teaching is mainly directed to form a semiconductor package with an organic substrate such as PCB, it is believed that it would have been obvious to one of ordinary skill in the art to attach a semiconductor package to any other PCB by applying a suitable thermoplastic adhesive tape to the bottom surface of the semiconductor package such as a BGA package as well, motivated by the desire to provide a bonding layer for attachment, and with a reasonable expectation of success based on the prior art. Note also as evidence the state of the art JP 08250835 (English Abstract), which teaches that an LSI package having metallic bumps (i.e., a BGA package) can be connected to a printed wiring board with an intermediate film-like sheet of an organic resin having a melting point and coefficient of thermal expansion about the same as the metallic bumps (i.e., a thermoplastic adhesive as the intermediate layer).

For claim 6, it is conventional that the PCB is made of a laminate of epoxy resin impregnated glass mat.

For claims 8-10, Schrock lacks an express teaching of the various layouts of the thermoplastic adhesive. However, it is believed that suitable layouts of thermoplastic adhesive over the bottom surface of the BGA package is well within the skill in the art of

adhesive, motivated by the desire to provide adequate adhesion and also to minimize the cost. Note also as evidence of the state of the art Leander (US 2510120), which teaches that laying various shapes and forms of adhesive strips on a substrate at suitable locations is well within the ordinary skill in the art (Figs. 1 and 2).

With respect to product-by-process claims 11-13, Applicants must show that the resultant article is patentably distinct from those taught by the reference, since the method of forming the device is not germane to the issue of patentability of the device itself. Therefore, these limitations have not been given patentable weight.

For claims 14-15, Schrock lacks an express teaching of using a layer of pressure sensitive adhesive having a smaller surface area to provide initial attachment of the BGA array to the PCB. However, it is believed that it is old and well known that pressure sensitive is able to provide temporary adhesion for making an assembly quickly. Note also as evidence of the state of the art Hamerski (US 5593120), which is directed to a quick-mounting fastening assembly. Hamerski teaches that a layer of pressure-sensitive adhesive over the initial attachment surface affords adhering the fastening structure to a substrate by pressing the layer of pressure sensitive adhesive against the substrate. A layer of hot-melt adhesive covering the main attachment surface can then be heated to melt the layer of hot-melt adhesive so that upon cooling the layer of hot melt adhesive will be adhered to the surface of the substrate (Abstract). Further, The “hot-melt adhesive" encompasses "heat-activated adhesive" and "thermoplastic adhesive" (column 1, lines 16-17). As such, it would have been obvious to one of ordinary skill in the art to include a layer of pressure sensitive adhesive over a

small area of Schrock's thermoplastic adhesive, motivated by the desire to provide a quick assembly process.

For claims 16-19, it is believed that a suitable height (i.e., amount) of the thermoplastic adhesive layer, relative to the solder bump height, is either inherently disclosed by Schrock, or an obvious optimization to one of ordinary skill in the art of hot-melt adhesive and BGA packaging, note also as evidence the state of the art Gilleo et al. (US 5637176), which is directed to the joining of the electronic circuit components (Abstract). In Fig. 8A, Gilleo shows a suitable thinner adhesive film is used to join a thicker conductive body between an electronic component and a PCB.

For claims 20-22, Schrock lacks an express teaching of the complex viscosities of the thermoplastic adhesive at various temperatures. However, JP '835 does teach that a suitable hot-melt adhesive has a melting point about the same as the metallic bumps, and it is well known that melting point and melt viscosities are related thermal properties of thermoplastics. As such, it is believed that suitable viscosities at various temperatures are believed to be either inherently disclosed by Schrock, or an obvious optimization to one of ordinary skill in the art of hot-melt adhesive and BGA packaging, motivated by the desire to render the adhesive flowable at a suitable bonding temperature.

For claims 62-69, Schrock lacks an express teaching of the tensile properties of the thermoplastic adhesives. However, it is noted that the scope of the Schrock's invention of forming an adhesive bond between a semiconductor package with an organic substrate such as PCB is essentially the same as the instantly claimed

invention. As such, it is believed that suitable tensile properties are either inherently disclosed by Schrock, or an obvious optimization to one skilled in the art of hot-melt adhesive, motivated by the desire to obtain a strong adhesion between the adherands.

For claim 70, it is believed that Schrock's thermoplastic adhesive is inherently electrically non-conducting, otherwise the BGA package would be rendered inoperative due to short circuiting.

8. Claims 23-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schrock et al. (US 6541872) in view of Narushima et al. (US 6426138).

The teachings of Schrock are again relied upon as set forth above.

For claims 23-34 and 36-38, Schrock lacks an express teaching of the composition of the thermoplastic adhesive. However, it is noted that Narushima's invention is directed to an adhesive film for BGA packing (Abstract). Narushima teaches that either a thermosetting adhesive or a thermoplastic adhesive may be employed for BGA packaging (column 5, lines 3-4). Preferable thermoplastic adhesives are those with glass transition temperature ranging from 30 to 180°C. For example, thermoplastic polyimide, or polyolefin type resins such as ternary copolymers consisting of polyethylene, ethyl acrylate, and maleic anhydride, copolymers consisting of ethylene and glycidyl methacrylate, or the like, may be employed. Narushima lacks an express teaching of certain thermoplastic compositions such as derivatives of functionalized polyolefin adhesives and adhesive blends at various ratios. However, it should be noted that Narushima does teache that the suitable thermoplastic adhesives are those with glass transition temperature in the range from 30 to 180°C, and

adhesives with the same thermal properties can be used as set forth above. As such, it is believed that in addition to the expressly taught adhesives as set forth above, in the absence of unexpected results, the aforementioned adhesive derivatives and blends are also believed to be either inherently disclosed, or an obvious selection based on Narushima's teaching.

For claims 35, in the absence of unexpected results, it is believed that density of the functionalized polyolefin is an inherent material property. It should be noted that where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a *prima facie* case of either anticipation or obviousness has been established. See MPEP § 2112.01.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor S Chang whose telephone number is 703-605-4296. The examiner can normally be reached on 8:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel H Morris can be reached on 703-308-2414. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

VSC

DANIEL ZIRKER
PRIMARY EXAMINER
GROUP ~~1365~~
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